**Mineral vs. Rock**

Rock = ?
An aggregate of MINERALS

**Minerals-building blocks of rocks**

Crystalline Solids…
crystalline = orderly arrangement of atoms
Naturally Occurring…
Typically inorganic Substances…
Definite Chemical Composition
eg: SiO₂ for Quartz
KAlSi₃O₈ for Feldspar
Fe₃O₄ for Magnetite
CaCO₃ for Calcite
NaCl for Halite (table salt)

**Elements & Atoms**

Element
Characteristic form of matter
Cannot be divided into other elements
by ordinary chemical processes…

Atoms
Smallest possible portion of an element:
Nucleus (protons and neutrons)
Electrons (in surrounding shells)

**Atomic structure**

"Atomic Mass Number" = # of protons + # of neutrons

"Isotopes" are varieties of an element with varying # of neutrons

**Compounds**

Two or more elements bonded together

Hydrogen
Oxygen
Question of the Day

What is the crust of the Earth?

What are the most abundant Elements???

How do we use them in our society?

<table>
<thead>
<tr>
<th>Element</th>
<th>Approximate Percentage by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen (O)</td>
<td>46.6</td>
</tr>
<tr>
<td>Silicon (Si)</td>
<td>27.7</td>
</tr>
<tr>
<td>Aluminum (Al)</td>
<td>8.1</td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>5.0</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>3.6</td>
</tr>
<tr>
<td>Sodium (Na)</td>
<td>2.8</td>
</tr>
<tr>
<td>Potassium (K)</td>
<td>2.6</td>
</tr>
<tr>
<td>Magnesium (Mg)</td>
<td>2.1</td>
</tr>
<tr>
<td>All others</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Bonds
Ionic -- exchange of electron(s)
Covalent -- sharing electron(s)
Metallic -- electrons move freely

Crystalline arrangement of Silicate Minerals all contain the Silicon-Oxygen Tetrahedron

A Arrangement of atoms in silicon-oxygen tetrahedron
B Diagrammatic representation of a silicon-oxygen tetrahedron

Single tetrahedrons require more positively charged ions to maintain electrical neutrality…

…than two tetrahedrons sharing an oxygen atom

Single chain silicate structure

Fragments of calcite showing cleavage
The Physical Properties of Minerals

- Color
- Streak
- Luster
- Hardness
- External Crystal Form
- Cleavage

The Physical Properties of Minerals (cont.)

- Fracture
- Specific Gravity
- Special Properties
- Other Properties
- Chemical Tests